SECTION 13815

ENERGY MONITORING AND CONTROL SYSTEMS (EMCS)
EXTENSION TO EXISTING SYSTEM

06/95

PART 1 GENERAL

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(1997) Enclosures for Electrical Equipment (1000 Volts Maximum)

UNDERWRITERS LABORATORIES (UL)

UL 864	1991 (R 1994) Control Units for Fire-Protection Signaling Systems

1.3 SCOPE

The monitoring and control of the heating and air conditioning equipment shall be connected to the existing Honeywell Graphic Operator Interface Central Computer Control System located in Building 6206. The monitoring and control system shall utilize existing software programs for the automatic operation of the heating and air conditioning equipment. Work includes furnishing and installation of Direct Digital Controllers (DDC), interior cables and wiring for the terminal unit control transmission network, equipment, controls, appurtenances and connections up to the DDC panel data terminal cabinet (DTC), Terminal Unit Controllers (TUC) and Terminal Unit Controller network, software programming, configuration, and startup. All new points shall be displayed on dynamic color graphics on each of the existing work stations on the LAN. The extensions, when installed, shall permit certain energy-consuming systems and equipment in the building to be monitored, controlled, and automatically operated and logged by the central apparatus in Building 6206 so as to optimize the performance and energy consumption of the system and equipment. All devices and installation from the DDC DTC to the field and from Terminal unit controllers to the field shall be provided by Section 15951.

1.4 SYSTEM DESCRIPTION

1.4.1 General

Ft. Lee has an existing Honeywell Delta Network Graphic Operator Interface Control System. Direct digital controllers shall be Honeywell R7044 Excel Plus controllers compatible with the existing Honeywell Delta Network Graphic Operator Interface Control System.

1.4.2 System

The monitoring and control system as specified herein shall be provided in its entirety by this Contractor. It shall be fully compatible in every respect with the existing Honeywell computerized system. The Contractor shall base his bid on the specific performance characteristics of the monitoring and control system as described in the contract specifications and shown on the contract drawings. The present energy control system includes programs for direct digital control, load shedding, optimization, totalizing, boiler profile, reset, and various logging routine programs, sensors, data transmission, and data reduction.

1.5 GENERAL REQUIREMENTS

a. The Contractor shall furnish all necessary tools, equipment, materials, and labor to install on-line, real time, monitoring and control system extensions as described hereinafter and as shown on the contract plans and specifications. The system shall be fully integrated and installed as a package that is compatible with and will interface with the present system in every respect. Contract requirements shall be fulfilled only by the expansion of the existing distributed processing system. Unique stand-alone processors will not be allowed. The extensions shall include all computer software and hardware, transmission equipment, wiring, piping, DDC panels, labor and supervision up to the DDC DTC. Adjustment and calibration shall be provided as a prerequisite to the start of warranty and maintenance service specified hereafter.

b. The Contractor shall have an office within 50 miles of the site staffed with factory-trained personnel fully certified to install and service all systems components. All system commissioning and service shall be performed under the direct supervision of technicians regularly employed by the manufacturer.

c. The Contractor shall have a 5-year successful history in the design and installation of fully computerized control systems, 3 years of which shall be in computerized building systems similar in performance to the one specified herein and shall produce evidence of this history as a condition of acceptance and approval prior to award.

d. If telephone communication is utilized, the Contractor shall provide the Government with a schematic drawing showing required number of telephone pairs to the building. Telephone pairs will be provided by the Government to a telephone terminal cabinet in the building.

e. The installation shall include computer programming, installation drawings, central and remote equipment, cable and wiring for the terminal unit control transmission network, relays, field wiring, labor, supervision, calibration, checkout and training necessary for an operational system up to the DDC DTC (see plans). Computer programming shall include all necessary programming of central EMCS control as required to provide a complete operating system.

f. System componants, microsporcessors and programming shall be year 2000 compliant.

g. The contractor shall provide a Quality Control (QC) Manager on site during all phases of EMCS and DDC system installation and programming.

This QC manager shall be factory trained by the manufacturer providing the EMCS system. This QC manager shall be responsible for Quality Control of work specified by this section and work specified by Section 15951 DIRECT DIGITAL CONTROL FOR HVAC.

h. The contractor shall provide all necessary coordination with mechanical, plumbing, electrical, etc. contractors, and the equipment these contractors will provide, to insure the installation of a complete and operational EMCS/DDC control system.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTALS:

SD-01 Data

Equipment Data; GA

Submit drawings and lists of materials and equipment to be incorporated in the work. A complete electrical connection diagram for each electrically controlled component, furnished under this division, having more than one automatic or manual control device. Wiring diagrams shall identify each component and one diagram shall show all interconnected or interlocked components. The lists of materials and equipment shall be supported by sufficient descriptive materials such as catalogs, cuts, diagrams, and other data published by the manufacturer to demonstrate conformance to the specification requirements; model numbers alone will not be acceptable. The data shall include the address and name of the nearest service and maintenance organization that regularly stocks repair parts.

SD-04 Drawing

Systems Drawings; GA.

The systems drawings shall include the following:

a. A drawing index.

b. a list of symbols

c. A series of drawings for each HVAC control system using abbreviations, symbols, nomenclature and identifiers as shown on the contract drawings. Each control-system element on a drawing shall have a unique identifier as shown.

The submittal shall include specification sheets for all hardware and software elements including engineering and performance data, schematic layouts and shall indicate that the speed and accuracy will match that of the present system.

SD-08 Statements

Certificates of Compliance; GA

Certificates of compliance attesting that all materials to be incorporated

in the work meet the requirements specified shall be furnished in accordance with the General Provisions.

SD-08 Statements

Contractor Proprietary Information; FIO

The Contractor is hereby notified that the existing EMCS system contains manufacturer's proprietary information protected by restricted and limited rights. This information includes software and technical data that shall not be made available to the bidders.

SD-19 Operation and Maintenance Manuals

Operation and Maintenance Manuals; GA

Provide six complete copies of the manuals bound in hardback, loose leaf binders, to the Government after acceptance. Provide manuals for new types of EMCS equipment not previously used as part of the existing Honeywell EMCS.

1.4 WORKMANSHIP

a. Materials and equipment shall be installed in accordance with the approved recommendations of the manufacturer to conform to the contract documents. The installations shall be accomplished by workmen skilled in this type of work.

b. The Quality Control (QC) Manager provided by this section shall provide QC supervision and documentation of work specified by this section and work specified by Section 15951 DIRECT DIGITAL CONTROL FOR HVAC in accordance with requirements of Contractor Quality Control (CQC) as set forth is Section 01440 CONTRACTOR QUALITY CONTROL.

1.5 CONTRACT COMPLETION, GUARANTEE AND SERVICE

a. All components, parts, and assemblies shall be guaranteed against defects in workmanship and materials for a period of one year after acceptance of the entire energy control system. In addition, the Contractor shall provide operation instructions and system maintenance training as described hereinafter for the primary system as well as the subsystems.

b. Expressed warranties are conditionally based upon the requirement that the item or items covered within the guaranteed are used and maintained in accordance with the manufacturer's recommendations.

PART 2 PRODUCTS

2.1 SYSTEM

Furnish and install the extension to the present multiprocessor, solid state digital centralized computer energy control system to monitor, control and evaluate all points scheduled, shown and specified.

2.2 CENTRAL HARDWARE AND REMOTE NETWORK CONTROL PANELS, LOCAL CONTROL

PANELS, TERMINAL UNIT CONTROLLERS AND DDC PANELS

a. Furnish and install all energy control equipment and apparatus required to supplement the existing system hardware, including but not limited to:

LAN capacity
Central processor capacity
DDC panels
Terminal Unit Controllers
Relays and cabinets
Modems, translators, cabinet and miscellaneous equipment as required to cause the work of this contract to function with the present system.

b. Indications on the drawings of exact quantities of any items of hardware are intended to show the quantities believed to be required for the extensions to be made to the present energy control system. It is recognized that the manufacturer and supplier of the equipment may be able to provide these items with configurations that will require greater or lesser quantities than those indicated in order to accomplish the desired results. This Contractor shall furnish and install all necessary apparatus, wiring, connections and arrangements as limited above, necessary to incorporate the required items of hardware into the system so as to accomplish the specified results.

c. Furnish NEMA 250 Type 12, panel for DDC panels with hinged door and hasp. Fort Lee DEH shall provide a padlock for each panel enclosure.

d. The direct digital control (DDC) panels shall be UL 864 6 bit microprocessor based with EPROM for operating system (O.S.) and EMS programs and 72 hour battery backed clock and RAM for DDC programs and data files. Microprocessor and EPROM shall be socketed for field chip replacement.

e. The real time clock shall have one hundred year calendar with automatic leap year to provide time of day, day of week and date.

f. The microprocessor based DDC shall be provided with capacity to accommodate a maximum of 64 input/output (I/O) points. DDC with a minimum capacity of 32 points are to be provided as the locations shown on the job drawings. Plug in expansion to the maximum 64 points shall be provided as required by the I/O summary DDC shall also include totalizer inputs to accommodate demand meter pulse counts and plug for POT. DDC shall be provided with all electronics such that implementation to its full capacity requires no additional cards or devices other than load control relays or pneumatic output transducers.

g. All DDC inputs shall be of the universal to handle industry standard current, voltage, resistance or open and closed contacts in any mix. Programmable intermediate ranges and linearization tables shall be provided for sensor types listed under the sensor section of this specification. For all RTD type sensors of 1000 ohms or less, contractor shall individually calibrate each input

point via precision decade box to compensate for lead length errors.

h. DDC shall accommodate both digital and true outputs of voltage (0-12V) and current (4-20ma). All analog outputs shall have a minimum incremental resolution of .5 percent of the full operating range of the valve or damper (not .5 percent of 0-12V output). Zero and maximum output voltage or current values, however, shall be used for shutdown and closeoff modes. For troubleshooting and load analysis, the value of each analog output shall be available in the database for trending and display.

i. DDC packaging shall be such that complete installation and check out of field wiring can be done prior to the installation of electronics boards. All board terminations are to be made via plug in connections to facilitate trouble shooting repair and replacement. The complete DDC including accessory device such as relay, power supplies, etc., shall factory mounted, wired and housed in a steel enclosure.

j. DDC shall be equipped with diagnostic LED indicators for transmit, receive, power up test, power up fail, power up test OK and bus error. Each digital output point shall have a status light on the face of the DDC enclosure.

k. DDC shall operate on a stand alone basis; all EMCS and control software shall be resident in the DDC.

l. DDC shall be compatible with the existing Honeywell Graphic Operator Interface Central Computer.

m. All microprocessor based systems shall be year 2000 compliant.

2.3 WIRE AND CABLE WORK

All electrical wiring shall conform to the requirements of Section 16415 ELECTRICAL WORK, INTERIOR. Electrical wiring shall include but not be limited to:

a. Transmission cables conducting signals from DDC panels to telephoneterminals cabinets, central processing units, inside buildings and underground.

b. 120 volt wiring for power supplies to data gathering panels, relays and as otherwise may be required.

c. Terminal unit controller wiring including transmission to the DDC panels, wiring of terminal unit control devices and terminal unit controller sensors.

d. Input/output wiring from DDC panels to Data Terminal Cabinets (DTC).

e. Wires and cables shall be:

1. Transmission cables inside buildings shall be twisted with between 5 and 12 twists per foot, #18 to #24 AWG, no more than 22

picofarads per foot measured in free air, and having insulation good for 300 volts minimum.

2. Multiconductor cables inside buildings for general use shall be 2 or 3-wire twisted cables with between 5 or 12 twists per foot #16 or #18 AWG, no more than 20 picofarads per foot for pairs or 35 picofarads for triplets measured in free air, and having insulation good for 600 volts minimum.

3. All work installing conduits, terminal strips and cabinets shall be done only in coordination with the personnel of the Fort Lee Signal Office and under supervision of the Contracting Officer. Arrangements shall be made in advance with the Chief of the Signal Officer prior to commencing any such work. Interference in any portion of the communication system at Fort Lee shall meet the requirements of the Signal Officer. All connections to telephone equipment shall be made only as directed by designated Signal Office personnel.

2.4 DATA TRANSMISSION MEDIA (DTM)

2.4.1 General

The Contractor shall provide DTM as shown. The DTM will not include MODEMs. The DTM shall consist of two (2) of phone lines from EMCS central in Building 6206 to telephone backboard in the building. Test all DTM 30 days after installation and no more than 90 days prior to the Contractor's need date and furnish reports to the Government noting any deficiencies. Provide overvoltage and surge protection as specified.

2.4.2 DTM Characteristics

Performance characteristics of the Contractor furnished DTM are equal to those existing DTM serving the EMCS.

2.5 APPLICATIONS PROGRAMS

Perform all functions specified in the I-O summary tables by use of the appropriate application programs.

2.6 ACCEPTANCE AND WARRANTY PROCEDURES

a. The warranty shall cover a period of 12 months and shall formally transmitted within 15 calendar days of completion of all work and operational programming, to the Contracting Officer, designating addresses and telephone numbers for service. The Contracting Officer will designate a resident Contracting Officer and Contracting Officer's representative for administration of the warranty. The warranty shall become effective upon acceptance of the entire system. The acceptance of the entire system will be upon completion of all construction, training and operational testing covered in the contract and conclusion of the transfer inspection.

b. Submittal data relevant to point index, functions, limits, sequences, interlocks, logs, software routines and associated parameters, and other pertinent information for the operating

system and data base shall be forwarded from the Contractor to the Contracting Officer. Approved software packages shall be entered into the central computer and debugged. Prior to on-line operation, a complete demonstration and read out of the computer real-time responsibilities of surveillance and command shall be performed in the presence of the Contracting Officer. This demonstration having satisfactorily met previously approved submittals, it shall have the Contracting Officer's written acceptance, thereby allowing commissioning of the EMCS for on-line operation.

c. Upon successful completion of system generation, the Contracting Officer shall be requested in writing to inspect and approve the satisfactory operation of the automation system, subsystem and accessories.

2.7 VARIABLE AIR VOLUME (VAV)TERMINAL UNIT CONTROLS & CONSTANT AIR VOLUME (CAV) TERMINAL UNIT CONTROLS

The terminal units shall be as specified in Section 15895 AIR SUPPLY, DISTRIBUTION, VENTILATION AND EXHAUST SYSTEM. Terminal unit controls shall consist of individual box controllers which shall be fully interfaced to the control system through dedicated DDC panels. The terminal box controllers shall be interfaced to the system through the DDC panel that controls the AHU serving that box. A digital wall module compatible with the temrinal box controllers will locally display space temperature, setpoint, occupied/unoccupied mode selections. The Terminal Unit Controllers (TUC) and wall module shall be provided by Honeywell.

2.7.1 Box Control Device

Controls for pressure independent boxes shall consist of a velocity-sensing device in the primary air entering the box, a room temperature sensing element, a damper actuator, and an adjustable microprocessor-based box controller. Each controller shall operate a damper for cooling. Actuator shall open or close the device to which it is applied within 6 minutes. Terminal unit controls shall meet the requirements of UL 916 and 47 CFR 15.

Controls for pressure independent boxes with supply fans shall consist of a velocity-sensing device in the primary air entering the box, a room temperature sensing element, an adjustable microprocessor-based VAV box controller, a damper with actuator, and a duct pressure switch to operate the supply fan. Each controller shall operate a damper for cooling and a hot water duct coil for heating. Terminal unit controls shall meet the requirements of UL 916 and 47 CFR 15.

Each VAV box controller shall have a provision for occupancy overrides. Based upon the contact status of a manual switch in the wall mounted space temperature sensor, the VAV box controller shall override set back control points as allowed by EMCS.

PART 3 EXECUTION

3.1 EXECUTION

3.1.1 Installation

Install all system components and appurtenances in accordance with the manufacturer's recommendations and as shown. Provide all necessary interconnections, services and adjustments required for a complete operable system. All electrical work shall be in accordance with NEPA 70 and as specified. Provide instrumentation and communications grounding as necessary to preclude ground loops and noise from adversely affecting system operation.

3.1.2 Programming

Install necessary firmware and software, enter all turning constants, parameters. Checkout and debug all programs. Document all software and archive as directed by Ft. Lee EMCS personnel. Provide all necessary firmware and software necessary to provide complete EMCS control at base central control.

3.1.3 Graphics

Construct dynamic color graphics to reside on each LAN work station. Provide a separate graphic for each control system. Provide floor plan graphics with associated space points. Provide graphic links using terminal unit location on floor plan graphic to penetrate to individual room graphic.

3.1.4 DDC Panels

The Contractor will provide DDC panels with NEMA 12 enclosures and lightning protectors. Contractor shall receive and store the DDC panels and protect them from damage until installation. Contractor shall install the DDC panel as directed by the manufacturer's recommended installation procedures and shall protect the installed panels from construction damage.

3.1.5 Summary Tables

Use I-O summary tables in conjunction with the drawings to identify the hardware and software required for each building and system. It is not the intent of the specification to identify individual point requirements for a particular system. The I-O summary table shall always take precedence over the specification in defining point requirements.

-- End of Section --